

**FIELD KEY TO THE EPIPHYTIC ORCHIDS
OF GHANA BASED ON CHARACTERS
OF SHOOTS AND INFRACTESCENCES**

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INTRODUCTION

Phytosociological work in the tropical forest is made difficult by the multiplicity of species, and by the infrequency with which plants are discovered in flower. In practice, large trees are identified mainly from characters of trunk and slash, while small trees and shrubs can often be named by comparison of leafy shoots with herbarium specimens.

Orchids present a special difficulty to the ecologist because keys in standard floras are of necessity based mainly on characters of the flowers. The leafy parts shrivel on drying, so that features which are obvious enough in the field are lost, and do not find their way into the Flora. The same is true of habit characters such as direction of growth of leaves, stems and inflorescences. Plants may therefore have to be cultivated for several months, until flowers are produced, before they can be identified. It is largely this difficulty which has discouraged the study of orchid ecology and distribution. Many epiphytes have interesting distribution patterns which are uncomplicated by soil factors.

Our aim in this paper is to help the ecologist to identify orchids in the field even when not in flower. It is frequently impossible to name plants which are in a completely vegetative condition. But careful search will often reveal old inflorescences, which provide enough characters in their bracts, dimensions, shapes, fruits and so on, to enable almost all our epiphytic orchids to be distinguished with reasonable certainty. Some detective work may be necessary, piecing together evidence from the bracts caught in spiders webs, half-decayed fruits, and the stumps of peduncles. Expressions in the keys such as „ 6-flowered ” or „ flowers 5 mm apart ” don't imply that flowers must be present as such before the key can be used; bracts, scars, fruits and pedicels can be used to provide data from which deductions can be made as to the distribution of flowers. We have used floral characters only

in those few instances where they are essential (e.g. to distinguish *Polystachya tessellata* Lindl. from *Polystachya modesta* Rehb. f.). The perianth often persists for some time on the developing fruit. Of course, flowers should be examined when available. We hope that our keys will be used in conjunction with those in the account of *Orchidaceæ* for the Flora of West Tropical Africa ed. 2, 3, 1 : 180-276 (1968), where flowers are well described.

Measurements represent the typical, average condition. For example: figures for flower (or bract) separation refer to the central part of the rhachis, leaf lengths refer to full-grown leaves which are neither unusually lush nor depauperate. In the field, a range of specimens may usually be observed and the extremes discarded—a procedure which is often impossible in the herbarium. For this reason the spread of any particular dimension is usually less in our key than in the Flora of West Tropical Africa.

There is as yet little interest in our indigenous orchids on the part of local amateur naturalists and gardeners. But among the 115 species included in this key a good number are beautiful or spectacular. *Ansellia africana* Lindl., *Angræcum birrimense* Rolfe, *Plectrelminthus caudatus* (Lindl.) Summerh., are among those well worth cultivation. We hope that this key will help the collector to know what sort of flowers the orchids he finds will later produce.

Our use of a few terms requires precision:

LEAF means the expanded lamina, and is measured from apex to insertion on the leaf-sheath;

INFLORESCENCE is measured from its insertion on the stem to the tip of the rhachis;

RHACHIS is the part of the inflorescence axis beyond the lowest flower;

PEDUNCLE is the part of the inflorescence axis below the lowest flower;

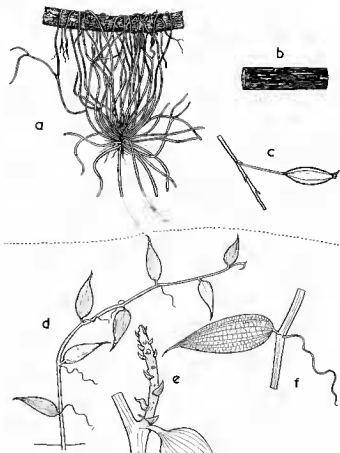
BRACT always subtends (or has subtended) a flower;

SCALE-LEAF is a non-floriferous reduced leaf.

We wish to express our gratitude to the Botany Department of the University of Ghana for the facilities made available to us for the collecting and rearing of live orchids on which this key is largely based; to the Director of the Royal Botanic Gardens, Kew, for permission to use the Herbarium; to Mr. P. F. HUNT for assistance with determinations; to Mr. V. S. SUMMERHAYES for looking through the manuscript and making useful suggestions for its improvement; and to Mr. S. K. AVUMATSOO for preparing the illustrations.

KEY TO GROUPS OF ORCHIDS

1. Growth monopodial : terminal bud grows indefinitely; inflorescences from axils of foliage leaves (plates 1, 2 and 3). GROUP A, p. 142

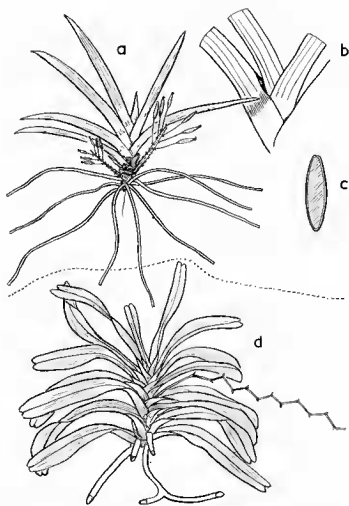


PL. 1. — *Microcoslia caespitosa* (Rolfe) Summerh. : a, habit of whole plant hanging from tree branch $\times 1/6$; b, part of root showing pseudo-lenticels $\times 3$; c, fruit $\times 1.5$. — *Vanilla africana* Lindl. : d, habit $\times 1/4$; e, inflorescence axis $\times 1$; f, node and attached leaf showing venation, leaf-base, and attachment of root $\times 1/2$.

- Growth sympodial : leafy shoot of limited growth; stem usually thickening to form a pseudobulb; new leafy shoots arising from pseudobulbs 2
2. Inflorescence scapose: originating from base of pseudobulb, bearing scale-leaves, but devoid of foliage leaves (plate 4). GROUP B, p. 148
- Inflorescence terminating the leafy shoot (plate 5). GROUP C, p. 152

Group A

1. Plant quite leafless; roots are responsible for photosynthesis and constitute almost the whole plant; stem less than 5 cm long 2
 Plant leafy 6
2. Pedicels about 10 mm long 3
 Pedicels 5 mm long or less 4
3. Inflorescences about 3 cm long; fruit 10 mm × 3 mm (see plate 1a, b and c).
 *Microcalia caespitosa*
 Inflorescences about 20 cm long or more; fruit 25 mm × 3 mm
 *Chauliodon Burlingii*
4. Plant very small, roots about 5 cm long; inflorescence less than 2 cm long
 *Teniophyllum Coxii*
 Plant much larger, roots to 20 cm long, inflorescence 8-15 cm long 5
5. Fruit about 9 mm long, broadly ellipsoid, symmetrical *Microcalia dahomeensis*
 Fruit 15-22 mm long, narrowly ellipsoid, banana-shaped
 *Encheiridion macrorrhynchium*
6. Leaf-sheath extremely short, not forming a tube; leaves succulent, flat, lacking a distinct midrib; leaf-apex acuminate and symmetrical; climbers rooting in the ground, sometimes becoming epiphytic (see plate 1 f) 7
 Leaf-sheath well-developed, tubular, enveloping part or all of the internode above its attachment; leaves succulent to thin, usually with a distinct midrib (except in *Diaphanathe bidens*, which has a bifid leaf-apex); leaf-apex usually more or less asymmetrical; true epiphytes 10
7. Leaves narrowly elliptic, 6-8 cm long and 2-3 cm wide (see plate 1 d, e and f)
 *Vanilla africana*
 Leaves broadly elliptic to obovate, 9-18 cm long and more than 5 cm wide 8
8. Stem 1-2 cm thick, speckled with darker spots; leaves obovate, without a distinct stalk *Vanilla imperialis*
 Stem less than 1 cm thick, not speckled; leaves broadly elliptic with distinct narrow stalk attaching the rounded base of the lamina to the stem 9
9. Bracts leafy, rounded, about 10 mm long *Vanilla crenulata*
 Bracts very small, about 3 mm long *Vanilla ramosa*
10. Leaves equitant : i.e. sharply infolded along the midrib, and upper surfaces fused together, leaf thus appearing to be laterally flattened in the plane of the axis; often Iris-like (see plate 2 b) 11
 Leaves not equitant; upper leaf-surfaces not fused together 16
11. Leafy stem elongated, 15 cm or more long, growing horizontal, pendulous or arching; leaves less than 2 cm long *Angraecum distichum*
 Leafy stem short, to 5 cm long, growing erect; leaves more than 2 cm long 12
12. Leaves 10-20 cm long, 8-15 mm wide, gradually tapered to acute apex 13
 Leaves 2-8 cm long, 5-12 mm wide, with obtuse to subacute apex, not gradually tapered (except sometimes in *Bolustella Talbotii*). 14
13. Bracts inserted about 1 mm apart on the rhachis, spirally arranged (see plate 2a, b and c) *Podangis dactyloceras*
 Bracts inserted about 5-10 mm apart, distichous *Rangaris rhipsalisocia*
14. Peduncle completely covered by scale-leaves; bracts 4 mm long, inserted 1 mm apart; leaves 1-3.5 cm long *Bolusiella imbricata*
 Peduncle exposed between the scale-leaves; bracts 2(3) mm long, inserted about 2 mm apart; leaves 2.6 (-8) cm long 15
15. Leaves oblong, 4-5 mm wide, apex obtuse; peduncle usually longer than rhachis *Bolusiella Batesii*
 Leaves elliptic-lanceolate, 8-10 mm wide, apex usually sub-acute; peduncle usually equal to or shorter than rhachis. *Bolusiella Talbotii*
16. Leaves crowded on the stem so that leaf-sheaths of successive mature leaves on the same side of the stem overlap; leafy part of stem rather short, seldom branching (see plates 2d and 3a) 17



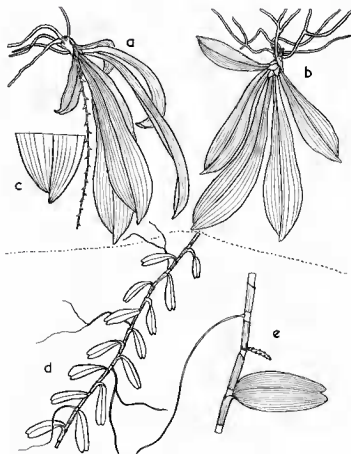
PL. 2. — *Podangis dactyloceras* (Reichb. f.) Schltr. : a, habit $\times 3/8$; b, leaf-sheath and fusion of upper leaf-surfaces $\times 1$; c, V. S. equitant leaf $\times 2.5$. — *Plectrelminthus caudatus* (Lindl.) Sumnerh. : d, habit $\times 1/6$.

- Leaves well spaced out along the stem so that leaf-sheaths of successive mature leaves on the same side of the stem do not overlap; leafy stem short or long, often branching (see plate 3d). 46
17. Leaves less than 7 cm long, succulent 18
 Leaves more than 8 cm long, succulent or not 19
18. Leaves less than 3 cm long by about 3 mm wide, very succulent, recurved, with acute, entire apex, deeply grooved along upper surface; inflorescences erect; fruits crowded, about 3 mm long *Botaniella tridifolia*
- Leaves 5-7 cm long by 4-6 mm wide, oblanceolate with asymmetrical acute or 2-lobed apex; inflorescences pendulous; fruits about 10 mm apart and 5 mm long *Aerangis calantha*

19. Leaves more than 50 cm long 20
 Leaves less than 50 cm long 23
20. Inflorescences about 5 cm long; almost hidden in the leaf-bases; leaves linear, 1.5-2 cm wide, 50-100 cm long, acuminate with one lobe much longer than the other *Ancistrothynechus clandestinus* (fringing forest form)
 Inflorescences more than 15 cm long; leaves linear or oblanceolate, 50-60 cm long, never long-acuminate 21
21. Leaves falcate-linear, about 2 cm wide *Chamwangis vesicata*
 Leaves oblanceolate, 5-10 cm wide 22
22. Flowers 8-10 mm apart; bracts 1 mm long *Chamwangis ichneumonea*
 Flowers 10-14 mm apart; bracts 5-7 mm long (see plate, 3a, b and c) *Diaphanthe pellucida*
23. Inflorescences less than 2(-3) cm long, many-flowered, crowded, flowers less than 1 mm apart; inflorescences scarcely exerted from the leaf-sheaths; leaves 7-30 cm long 24
 Inflorescences elongated; 3-50 cm long, well exerted, flowers at least 1 mm apart and usually more 28
24. Lobes of leaf-apex not toothed, acutely acuminate, very unequal *Ancistrothynechus clandestinus* (high forest form)
 Lobes of leaf-apex each with 2 or more short teeth, lobes usually rounded, never acuminate. 25
25. Leaves sharply infolded towards the base, bringing the two sides of the lamina into contact 26
 Leaves not so sharply infolded, upper surface of lamina exposed to the base *Ancistrothynechus recurvus*
26. Leaves 7-10 cm long, stiff and succulent; sinus present between the slightly dentate, obtuse lobes of the apex *Ancistrothynechus Melleniæ*
 Leaves 15-30 cm long, not succulent or only slightly so 27
27. Leaf-apex irregularly dentate with sharp teeth about 1 mm long; no sinus at apex; leaves 25-30 cm long *Ancistrothynechus capitatus*
 Leaf-apex with two obtuse lobes which are very slightly and bluntly dentate; sinus present between lobes; leaves 15-20 cm long *Ancistrothynechus cephalotes*
28. Leaves attached symmetrically to the leaf-sheath, not twisted to one side at the base; leaf more or less infolded along the midrib at least towards the base; midrib straight or recurved in the plane of the stem, not curving to one side; leafy part of stem growing more or less vertically upwards (see plate 2d) 29
 Leaves attached asymmetrically to the leaf-sheath, twisted to one side at the base so that the upper surface of the leaf is flattened in the plane of the stem; leaf flat, not strongly infolded along midrib; midrib usually curved inwards towards the stem, lamina asymmetrical; stem growing horizontally, or obliquely upwards (see plate 3b) 36
29. Leaves 3.5-5 cm wide, roots 8-10 mm diameter; orchids of savanna woodland. 30
 Leaves less than 3 cm wide roots less than 7 mm diameter; forest orchids 31
30. Inflorescences up to 50 cm long, very zigzag; bracts about 1 mm long, inserted 3-4 cm apart (see plate 2d) *Plectrominthus caudatus*
 Inflorescences up to 25 cm long, scarcely zigzag; bracts 15 mm long, inserted about 2 cm apart *Cyrtorchis arcuata*
31. Upper surface of leaves dotted with small pin-point pits even when young; each lobe of leaf-apex bluntly and slightly two-toothed; flowers inserted 1-2 mm apart *Listrostachys perlusa*
 Upper surface of leaves smooth at least when young; lobes of leaf-apex entire; flowers inserted more than 5 mm apart 32
32. Leaves narrowly linear, 5-9 mm wide by 18-22 cm long; inflorescences 5-40 cm long 33

- Leaves broadly linear to oblong, 1.5-2.5 cm wide by 8-20 cm long; inflorescences 10-15 cm long 34
33. Leaves very fleshy, U-shaped in section, without distinct midrib; inflorescences more or less straight, 5-10 cm long; bracts 1-1.3 cm apart, 1 cm long, broadly ovate *Cyrtorchis Aschersonii*
 Leaves somewhat fleshy, V-shaped in section, with distinct midrib; inflorescences zigzag, 20-40 cm long; bracts 1.5-2 cm apart, 2 mm long *Aerangis Laurentii*
34. Leaves closely imbricated; leafless older part of stem never more than 15 cm long and usually much less; rhachis slender, 1-2 mm thick. *Rangeria muscicola*
 Leaves somewhat separated, sheaths of mature leaves on the same side of the stem only just overlapping; leafless part of stem up to 40 cm long; rhachis slender or thicker 35
35. Rhachis 3-4 mm thick; bracts 12-15 mm long, 10-15 mm apart; inflorescences up to 10-flowered *Cyrtorchis hamata*
 Rhachis 1-2 mm thick; bracts about 5 mm long, 10-12 mm apart; inflorescences up to 15-flowered *Cyrtorchis ringens*
36. Leaves 30-50 cm long 37
 Leaves less than 30 cm long 39
37. Leaves linear, about 2 cm wide *Chamaeangis vesicata*
 Leaves oblanceolate, 5-10 cm wide 38
38. Flowers 8-10 mm apart; bracts 1 mm long *Chamaeangis ichneumonea*
 Flowers 10-14 mm apart; bracts 5-7 mm long (see plate 3 a, b and c). *Diaphanathe pellucida*
39. Leaves 4-7 mm wide *Aerangis calantha*
 Leaves more than 10 mm wide 40
40. Leaves succulent, smooth, not crinkled, narrowly oblanceolate, 1-2.5 cm wide . 41
 Leaves succulent or thin, margin and/or lamina conspicuously crinkled, obovate to broadly oblanceolate, 2-5 cm wide 43
41. Rhachis straight, not zigzag; bracts inserted about 3 mm apart
 Rhachis zigzag, bracts inserted 7-10 mm apart. *Chamaeangis sp. nov.* 42
42. Inflorescences 10-20 cm long; bracts 4 mm long *Diaphanathe Quintasii*
 Inflorescences 3-8 cm long; bracts 1-2 mm long *Diaphanathe suborbicularis*
43. Sinus present between the lobes of leaf-apex; leaves succulent . *Aerangis bitoba*
 No sinus at leaf-apex; leaves rather thin 44
44. Inflorescences about 5 cm long, bearing 2-7 flowers . . . *Eurychone Rothschildiana*
 Inflorescences more than 7 cm long, bearing 20-30 flowers 45
45. Inflorescences 7-8 cm long; flowers about 3 mm apart . . . *Diaphanathe sp. nov.*
 Inflorescences about 20 cm long; flowers about 10 mm apart *Diaphanathe curvata*
46. Leaves needle-like, 7-10 cm long by 2-4 mm diameter, pointed, almost circular in section, grooved along upper surface 47
 Leaves not needle-like, usually more or less flattened dorsiventrally . . . 48
47. Inflorescences 2-flowered, peduncle 1-2 mm long, covered by bracts, rhachis nil; leaves abruptly narrowed into sharp-pointed apex about 5 mm long *Angraecum subulatum*
 Inflorescences about 6-flowered, peduncle nil, rhachis 3-4 mm long, exposed; leaves gradually narrowed to acute, not pungent, apex *Tridactyle tridentata*
48. Inflorescences bearing only 1-3 flowers, 1-30 mm long 49
 Inflorescences bearing 4 or more flowers, 10-200 mm long 56
49. Inflorescences 2-5 mm long 50
 Inflorescences 10-30 mm long 52
50. Inflorescences with slender zigzag rhachis; filiform appendage 3-4 mm long attached to the rim of leaf-sheath opposite the lamina, appearing to subtend the inflorescence arising from the next node above; leaves devoid of scales even when young *Eggelingia clavata*

- Inflorescences sessile, lacking a distinct rhachis; leaf-sheaths without appendages; leaves bearing small, scattered, brownish scales when young . . . 51
51. Leaves very succulent, more or less deltoid in section, grooved along upper surface, 7-10 mm wide, distinctly tapering towards apex *Tridactyle crassifolia*
 Leaves stiff, subsucculent, more or less flat, 8-20 mm wide, oblong, not or scarcely tapering *Tridactyle anthomaniaea*
52. Leaf-sheaths rounded; some, but not all mature nodes producing a root; leaves 1.5-3 cm long *Dinklageella minor*
 Leaf-sheaths keeled; each mature node producing a root; leaves 1.5-12 cm long 53
53. Leaves lanceolate, gradually narrowed to acute, very unequal apex *Angræcum angustipetalum*
 Leaves oblong to elliptic; apex somewhat unequal, not gradually acute . . . 54
54. Inflorescences about 3 cm long; leaves (7)-10-12 cm long . . . *Angræcum birrimense*
 Inflorescences less than 2 cm long; leaves usually less than 8 cm long 55
55. Leaves 1.8-2.5 cm broad by 6-8(-10) cm long; lateral nerves prominent above; lamina rather thin. *Angræcum multinomatum*
 Leaves less than 1 cm broad by 2-7 cm long; nervation obscure; lamina succulent. *Angræcum Chevalieri*
56. Inflorescences less than 4 cm long 57
 Inflorescences more than 4 cm long 63
57. Inflorescences 2-5 mm long, about 4-flowered 58
 Inflorescences at least 10 mm long, 5 to many-flowered 60
58. Leaves 2-5 cm long; filiform appendage attached to rim of leaf-sheath opposite the lamina; rhachis slender, zigzag; young leaves devoid of scales *Eggelingia clavata*
 Leaves 3-8 cm long; leaf-sheaths lacking appendages; inflorescences sessile, lacking a distinct rhachis; young leaves bearing small, scattered, brownish scales 59
59. Leaves very succulent, more or less deltoid in section, grooved along upper surface, 7-10 mm wide, distinctly tapering towards apex. *Tridactyle crassifolia*
 Leaves stiff, subsucculent, more or less flat, 8-20 mm wide, oblong, not or scarcely tapering *Tridactyle anthomaniaea*
60. Leaf-sheath rounded in section, not keeled; leaf attached more or less symmetrically to the leaf-sheath, not much twisted to one side; leaves 3-5 cm long, apex with distinct sinus 61
 Leaf-sheath distinctly keeled; leaf strongly twisted to one side at its attachment to the sheath, so that the lamina lies in the plane of the stem; leaves 7-9 cm long, apex with slight or no sinus 62
61. Inflorescences 10-13 mm long, rhachis rigid, bearing flowers less than 1 mm apart; leaves 3-4 cm long (see plate 3 d and e) *Solenangis clavata*
 Inflorescences 30-40 mm long, rhachis slender, bearing flowers 4-5 mm apart; leaves 4-6 cm long *Solenangis scandens*
62. Bracts 3-4 mm long, inserted less than 1 mm apart; leaf-margin entire *Calyptrochilum emarginatum*
 Bracts 2 mm long, inserted 3 mm apart; leaf-margin denticulate. *Calyptrochilum Christyanum*
63. Leaves with lateral nerves prominent above but without a distinct midrib *Diaphananthe bidens*
 Lateral nerves not prominent, but midrib distinct and usually prominent below 64
64. Inflorescences bearing 50-100 flowers inserted 1-3 mm apart; pendulous; leaves often purplish *Diaphananthe rutila*
 Inflorescences bearing less than 30 flowers inserted 3 mm or more apart; inflorescences pendulous or horizontal; leaves never purplish 65



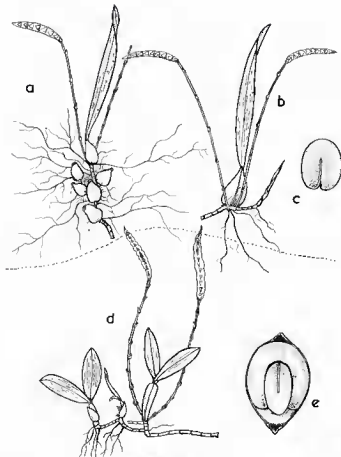
Pl. 3. — *Diaphanante pellucida* (Lindl.) Schltr. : a, habit in side view $\times 1/8$; b, habit in front view showing twisting of leaf at junction with sheath $\times 1/8$; c, leaf-apex $\times 1/4$. — *Solenangis clavata* (Rolle) Schltr. : d, habit $\times 1/4$; e, part of stem showing inflorescence axis piercing the leaf-sheath, and root originating from exposed part of stem below a node $\times 3/4$.

65. Leaves 3.5-7 cm long, less than 1 cm broad, oblong to oblanceolate; inflorescences pendulous below leafy shoot, zigzag, bearing flowers 4-5 mm apart
Diaphanante laxiflora
 Leaves 10-20 cm long, 1-4 cm wide, oblong to elliptic; inflorescences growing laterally between the leaves, straight, flowers 3-15 mm apart 66
66. Flowers inserted 3-6 mm apart 67
 Flowers inserted 10-15 mm apart 70
67. Flowers 5-6, inserted about 5 mm apart; leaves 6-7 cm long by 10-13 mm wide, narrowly elliptic; leaf-sheath rounded, not at all keeled
Solenangis scandens
 Flowers 10-20, inserted 3-4 mm apart; leaves 6-20 cm long, 5-10 mm wide, narrowly oblong; leaf-sheath slightly keeled 68

68. Leaves 6-11 cm long, less than 10 mm wide; spur shorter than lip petal *Tridactyle brevicarata*
 Leaves 10-15 cm long, 8-15 mm wide; spur several times longer than lip petal. 69
69. Leaves dark green, thin, with narrow midrib prominent below; lamina flat, not much infolded along midrib; leaf-apex with deep, narrow sinus; plant of rain forest *Tridactyle armeniaca*
 Leaves yellow-green, leathery, with broad midrib subprominent below; lamina distinctly infolded, long midrib; apex with or without sinus; plant of dry forest near savanna boundary *Tridactyle bicaudata*
70. Leaves 3-4 cm wide, elliptic, rather thin; inflorescences to 20 cm long *Cyrtorchis Monteiroa*
 Leaves 1.5-2.5 cm wide, narrowly oblong, fleshy; inflorescences to 15 cm long. 71
71. Bracts 10-15 mm long; rhachis stout : 3-4 mm thick; leaves rather close together; plant of high forest *Cyrtorchis hamata*
 Bracts 2 mm long; rhachis about 2 mm thick; leaves well-separated; plant of savanna woodland *Tridactyle Gentilii*

Group B

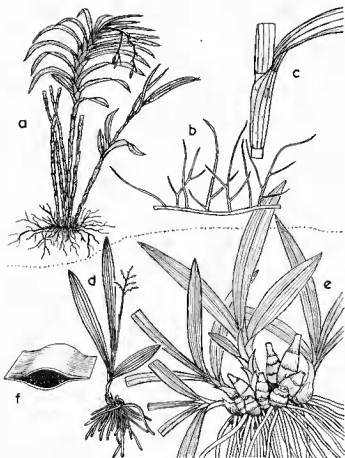
1. Pseudobulb bearing 3 or more leaves laterally; leaves thin, strongly ribbed; roots giving rise to slender vertical branches which grow away from the substrate to form a dense "thicket" about 5 cm deep *Graphorkis lurida*
 Pseudobulb bearing 1 or two leaves at its apex; leaves thin to succulent, lateral nerves not prominent; roots appressed to substrate 2
2. Pseudobulbs normally 1-leaved (see plate 4 *b* and *c*) 3
 Pseudobulbs normally 2-leaved (see plate 4 *d* and *e*) 15
3. Leaves less than 3 cm long by 5 mm wide; pseudobulbs 7-10 mm long 4
 Leaves more than 4.5 cm long by 5-50 mm wide; pseudobulbs more than 10 mm long 5
4. Inflorescence 2-3 cm long; bracts 4 mm long, inserted about 1 mm apart; peduncle 1 mm thick; rhachis straight; plant of mangrove forest
 *Bulbophyllum pipio*
 Inflorescence 5-10 cm long; bracts 2.5 mm long, inserted about 5 mm apart; peduncle 0.3 mm thick; rhachis zigzag; plant of high forest
 *Bulbophyllum inertextum*
5. Rhachis flattened, broadly winged, bearing flowers in a row down the middle of each face 6
 Rhachis terete, flowers arranged spirally. 8
6. Bracts subulate, mostly about 1 mm wide by 3-5 mm long, 2 mm wide at insertion and there about 1/4 width of rhachis, inserted about 10 mm apart along each side of the rhachis *Bulbophyllum colubrinum*
 Bracts triangular, almost as wide as the rhachis, overlapping 7
7. Bracts 9 mm long by 9 mm wide, apiculate, inserted about 4 mm apart along each side of the rhachis *Bulbophyllum magnibracteatum*
 Bracts 4 mm long by 4 mm wide, obtuse, inserted about 2.5 mm apart along each side of the rhachis (see plate 4 *a*, *b* and *e*) *Bulbophyllum Linderi*
8. Inflorescence pendulous, sometimes branching near the base; leaf-apex acutely acuminate *Bulbophyllum cocoinum*
 Inflorescence more or less erect, never branching; leaf-apex obtuse to acute, never acuminate. 9
9. Inflorescence 30-60 cm long; bracts 7-30 mm long 10
 Inflorescence 6-20 cm long; bracts 2-8 mm long 11
10. Bracts 25-30 mm long *Bulbophyllum phaeopogon*
 Bracts 5-8 mm long *Bulbophyllum distans*



Pl. 4. — *Bulbophyllum Linderi* Summerh. : a, habit showing arrangement of pseudobulbs on the rhizome $\times 1/2$; b, habit showing origin of pair of inflorescences from the rhizome on either side of the place of attachment of the pseudobulb $\times 3/4$; c, leaf-scar at summit of pseudobulb $\times 6$. — *Bulbophyllum maximum* (Lindl.) Rehb. f. : d, habit $\times 1/8$; e, double leaf-scar at summit of pseudobulb $\times 6$.

- | | |
|--|---------------------------------|
| 11. Pseudobulbs broadly ovoid to suborbicular, smooth; leaves usually very shallowly bilobed at apex, stiff and fleshy, 2 cm or more wide | 12 |
| Pseudobulbs ovoid, more or less rough-surfaced; leaves entire at apex, leathery, usually less than 2 cm wide | 13 |
| 12. Inflorescence about 6 cm long, peduncle more or less as long as rachis; bracts about 5 mm long, narrowly lanceolate, inserted about 3 mm apart | <i>Bulbophyllum saltatorium</i> |
| Inflorescence 10-15 cm long, peduncle about 1-3 cm long; bracts about 8 mm long, ovate, acuminate, inserted 4-8 mm apart | <i>Bulbophyllum barbigerum</i> |
| 13. Leaves 6-8 cm long; inflorescence 8-10 cm long, peduncle longer than rachis | <i>Bulbophyllum recurvum</i> |
| Leaves 8-15 cm long; inflorescence 8-18 cm long, rachis at least twice as long as peduncle | 14 |

14. Pseudobulbs 1-2 cm long, green, surface rugulose; bracts lanceolate, inserted 3-4 mm apart; rhachis twice as long as peduncle . . . *Bulbophyllum flavidum*
Pseudobulbs 2-3 cm long, reddish-brown, strongly rugose; bracts elliptic, inserted 1-2 mm apart; rhachis about 3 times as long as peduncle . . . *Bulbophyllum nigrilanum*
15. Leaves 4 cm long or less 16
Leaves more than 4 cm long 20
16. Leaves 1-2 cm long; inflorescence about 8 cm long, peduncle about twice as long as rhachis; bracts inserted about 5 mm apart . . . *Gengorchis pumila*
Leaves 2-4 cm long; inflorescence 4-15 cm long, peduncle shorter than rhachis; bracts inserted 2-4 mm apart 17
17. Rhachis slender; less than 1 mm diameter, not wider than peduncle; flowers somewhat secund (turned to one side) 18
Rhachis wider than peduncle; flowers not secund 19
18. Bracts about 3 mm long by 2 mm wide, inserted about 2 mm apart; pseudobulbs 2-3 cm long *Bulbophyllum rhtzophorae*
Bracts about 2 mm long by 1 mm wide, inserted 3-4 mm apart; pseudobulbs 1-2 cm long *Bulbophyllum falcipetalum*
19. Flowers inserted along the edges of the rhachis which is 1-3 mm wide and slightly flattened; bracts 2-4 mm long, clasping edge of rhachis, spreading *Bulbophyllum oreonastes*
Flowers inserted along mid-line of each flattened surface of rhachis which is 2-8 mm wide; bracts 1-2 mm long, reflexed . . . *Bulbophyllum melanorrhachis*
20. Rhachis 3 mm wide or less 21
Rhachis 3-13 mm wide 27
21. Bracts about 10 mm long, broadly ovate, imbricate, inserted about 5 mm apart *Bulbophyllum lupulnum*
Bracts 2-5 mm long, triangular to lanceolate, not overlapping 22
22. Flowers inserted along the edges of the slightly flattened rhachis; bracts rather stiff, spreading *Bulbophyllum oreonastes*
Flowers inserted on opposite sides of the terete rhachis, or if rhachis is flattened, inserted on its sides; bracts weak, more or less reflexed 23
23. Leaves 18-25 mm wide *Bulbophyllum bufo*
Leaves 3-16 mm wide 24
24. Bracts about 5 mm long by 3 mm wide, triangular; petals swollen at the tips *Bulbophyllum lenacukigerum*
Bracts 3-5 mm long by 1-2 mm wide, lanceolate; petals not swollen at tips 25
25. Bracts 5-7 mm apart along each side of rhachis; dorsal sepal subulate, pointed *Bulbophyllum congolanum*
Bracts 10-12 mm apart along each side of rhachis; dorsal sepal spatulate, obtuse 26
26. Leaves 5-15 mm wide, flowers reflexing after opening . . . *Bulbophyllum calyptratium*
Leaves 3-7 mm wide; flowers not reflexing . . . *Bulbophyllum graminifolium*
27. Inflorescence about the same length or shorter than the subtending leafy shoot (i.e. pseudobulb + leaves) 28
Inflorescence always considerably longer than the subtending leafy shoot 30
28. Leaves 3.5-5 cm long, inflorescence 4-8 cm long . . . *Bulbophyllum melanorrhachis*
Leaves 6-15 cm long; inflorescence 7-15 cm long 29
29. Rhachis puberulous along mid-line between the flowers; bracts triangular, 2 mm long by 2 mm wide; dorsal sepal spatulate, obtuse *Bulbophyllum velulinum*
Rhachis glabrous; bracts lanceolate, 4-5 mm long by 2-3 mm wide; dorsal sepal subulate *Bulbophyllum congolanum*
30. Peduncle 1 1/2-4 times as long as rhachis 31
Peduncle about equal to or somewhat shorter than rhachis 32
31. Bracts triangular, 5-7 mm long by 5 mm wide, overlapping; margin of rhachis flat; peduncle 3 or 4 times as long as rhachis . . . *Bulbophyllum imbricatum*



Pl. 5. — *Ansellia africana* Lindl. : a, habit showing long pseudobulbs and terminal inflorescence $\times 1/20$; b, part of root system showing erect rootlets $\times 1/2$; c, leaf-sheath and part of leaf $\times 1/4$. — *Polystachya dolichophylla* Schltr. : d, habit showing terminal inflorescence $\times 1/6$; e, habit showing arrangement of pseudobulbs $\times 3/8$; f, segment of flattened peduncle $\times 8$.

- Bracts lanceolate, about 4 mm long by 2 mm wide, not overlapping; margin of rhachis crinkled; peduncle about $1\frac{1}{2}$ times as long as rhachis (see plate 4 d and e) *Bulbophyllum maximum*
32. Leaves 18-30 mm wide 33
 Leaves 5-16 mm wide 34
33. Bracts 2-3 mm long, inserted 4-6 mm apart along each side of the thickish rhachis; leaves stiff and fleshy; pseudobulbs about 6 cm long, narrowly ellipsoid *Bulbophyllum oxypterum*
- Bracts 4-5 mm long, inserted 10-20 mm apart along each side of the rather thin rhachis; leaves leathery; pseudobulbs 3-5 cm long, ovoid *Bulbophyllum bufo*
34. Bracts 5-8 mm long by 3-4 mm wide, triangular; petals with swollen tips *Bulbophyllum tentaculigerum*

- Bracts 3-5 mm long by 1-2 mm wide, lanceolate; petals not swollen 35
35. Bracts inserted 5-7 mm apart along each side of rhachis; dorsal sepal subulate, pointed *Bulbophyllum congolanum*
- Bracts inserted 8-12 mm apart along each side of rhachis; dorsal sepal spatulate 36
36. Peduncle 10-15 cm long; bracts 1 mm wide just above insertion; petals subulate, subaeute, straight *Bulbophyllum calyptratum*
- Peduncle 5-8 cm long; bracts 2 mm wide just above insertion; petals laciniate, obtuse *Bulbophyllum falcatum*

Group C

1. Leaves orbicular, about 5 mm diameter, very fleshy and with no obvious midrib, paired on the small pseudobulbs; flowers solitary . . . *Stotzia repens*
- Leaves elongated, more than 1 cm long, midrib conspicuous, one to many leaves on each pseudobulb; inflorescence several-flowered 2
2. Old leaves shrivelling on the plant, not abscised; roots very fleshy, up to 1 cm thick; stem slender, not thickened at the base, bearing leaves spaced out along it *Habenaria procera*
- Old leaves abscised neatly from the leaf-sheath; roots less than 4 mm thick; stem usually thickened at the base to form a cylindrical or ovoid pseudobulb, leaves more or less congested 3
3. Pseudobulbs 30-50 cm long, stout and cylindrical; 2 cm thick; nodes 6-7 cm apart; leaves 25-30 cm long, with 2-4 main lateral nerves which arc as prominent below as the midrib; roots giving rise to slender erect branches forming a "thicket" about 5 cm deep (see plate 5 a, b and c) *Ansellia africana*
- Pseudobulbs usually less than 10 cm long, if up to 15 cm long then only 5 mm or less thick; midrib always much more prominent than lateral nerves; roots appressed to substrate 4
4. Stems 1-leaved, narrowly cylindrical, not thickened at base 5
- Stems bearing 2 or more leaves, usually more or less thickened at the base to form pseudobulbs 7
5. Leaves 20-30 mm wide, 20-35 cm long; inflorescence unbranched *Polystachya galeata*
- Leaves 1-6 mm wide, 5-15 cm long; inflorescence with secund (turned to one side) branches 6
6. Leaves more or less terete with a groove along upper surface, 1-3 mm wide *Polystachya tenuissima*
- Leaves flattened, 3-6 mm wide *Polystachya inconspicua*
7. Pseudobulbs giving rise to new pseudobulbs from about two thirds of the distance from their base, plant therefore with a lax, straggling habit; pseudobulbs slender and cylindrical, 3-4 mm wide by about 15 cm long *Polystachya cf. fusiformis*
- Pseudobulbs giving rise to new pseudobulbs from their base, plant therefore with a more or less tufted habit 8
8. Pseudobulbs very much flattened against substrate, about 4 times wider than thick, suborbicular, 2-4 cm diameter *Polystachya affinis*
- Pseudobulbs more or less erect, not flattened against substrate, more or less terete, less than twice as wide as thick 9
9. Inflorescence never branching, erect 10
- Inflorescence branching, erect to horizontal 14
10. Bracts 4-5 mm long, subulate with filiform tips; flowers 50 or more, very crowded; 1-2 mm apart 11
- Bracts 1-3 mm long, never filiform; flowers 20 or less, 2-5 mm apart 12
11. Leaves 20-25 cm long by about 2 cm broad, rather fleshy; leaf-apex slightly bilobed, with distinct sinus *Polystachya polychaeta*

- Leaves 10-15 cm long by 7-10 mm broad, thin not fleshy; leaf-apex acute, without sinus *Polystachya Adamsoniæ*
12. Leaves 2-3 cm long by 3 mm wide; inflorescence about 5 cm long, bearing about 6 flowers 5 mm apart *Polystachya parva*
Leaves 6-12 cm long by 10-15 mm wide; flowers 10-20 carried 2-3 mm apart 13
13. Bracts subulate, 1-2 mm long; flowers appearing with the leaves
. *Polystachya subulata*
Bracts broadly ovate, 3 mm long; flowers appearing while the plant is leafless. *Polystachya reflexa*
14. Branches of inflorescence secund; rachis covered by sheathing scale-leaves as far as the insertion of the highest branch 15
Branches of inflorescence not secund; rachis exposed 18
15. Leaves very fleshy, narrowly oblong, 14-18 cm long by 1.5-2 cm wide; shallow sinus in the obtuse apex *Polystachya golungensis*
Leaves rather thin, elliptic or oblanceolate, 10-30 cm long by 1-5 cm wide; leaf-apex acute to subacute, or obtuse, lacking sinus 16
16. Inflorescence less than 25 cm long, branches to 2 cm long; leaves to 2 cm broad; lip hairy, without keel *Polystachya modesta*
Inflorescence 20-70 cm long; branches to 5 cm long; leaves to 5 cm broad; lip glabrous, with keel 17
17. Leaves narrowly elliptic, acute or subacute at apex, to 3.5 cm wide
. *Polystachya mukandaënsis*
Leaves oblanceolate, more or less obtuse at apex, to 5 cm wide
. *Polystachya tessellata*
18. Stems not thickened at the base 19
Stems thickened and fleshy at the base, forming ovoid or cylindrical pseudobulbs 20
19. Leaves oblong-oblanceolate, 15-25 cm long by 3-4 cm wide, with 3-4 lateral nerves on each side, subprominent below; inflorescence to 30 cm long, curving downwards, branches 8-10 cm long; fruits about 25 mm long
. *Polystachya laxiflora*
Leaves elliptic, 6-12 cm long by 1-2.5 cm wide; lateral nerves not prominent; inflorescence 10-20 cm long, erect, branches to 7 cm long; fruits 4-8 mm long *Polystachya ramulosa*
20. Pseudobulbs oblong, 10-12 cm long by 2 cm wide and 1 cm thick; leaves spotted below with purple *Polystachya paniculata*
Pseudobulbs narrowly ovoid, 2-3 cm long; leaves plain green below 21
21. Inflorescence to 10 cm long, branches 1-2, up to 1 cm long; plant usually leafless when in fruit; lateral nerves not prominent *Polystachya subulata*
Inflorescence 20-30 cm long, branches longer than 1 cm; plant leafy while in fruit; lateral nerves subprominent above. 22
22. Inflorescence with 1-6 simple branches; peduncle winged: wings about 1 mm wide; leaves narrowly oblong, up to 25 cm long by 1.5-2 cm wide (see plate 5 d, e and f) *Polystachya dolichophylla*
Inflorescence with up to 10 branches which may themselves be branched; peduncle elliptic in section, not winged; leaves elliptic to oblanceolate, 25 cm long by 2.5-4 cm wide *Polystachya odorata*

ALPHABETICAL LIST OF THE EPIPHYTIC ORCHIDS OF GHANA

AERANGIS

- A. biloba* (Lindl.) Schltr.
A. calantha (Schltr.) Schltr.
A. Laurentii (De Wild.) Schltr.

ANCISTRORHYNCHUS

- A. capitatus* (Lindl.) Summerh.
A. cephalotes (Rehb. f.) Summerh.
A. clandestinus (Lindl.) Schltr.

ANGISTORHYNCHUS

- A. Mellesiae* (Kraenzl.) Summerh.
- A. recurvus* Finet

ANORAEUCUM

- A. angustipetalum* Rendle
- A. birrimense* Rolfe
- A. Chevalieri* Summerh.
- A. distichum* Lindl.
- A. multinominatum* Rendle
- A. subulatum* Lindl.

ANSELLIA

- A. africana* Lindl.

BOLUSIELLA

- B. Batesii* (Rolfe) Schltr.
- B. imbricata* (Rolfe) Schltr.
- B. iridifolia* (Rolfe) Schltr.
- B. Tatbotii* (Rendle) Summerh.

BULBOPHYLLUM

- B. barbigerum* Lindl.
- B. bufo* (Lindl.) Rehb. f.
- B. calyptratum* Kraenzl.
- B. cocoinum* Batem. ex Lindl.
- B. colubrinum* (Rehb. f.) Rehb. f.
- B. congolanum* Schltr.
- B. distans* Lindl.
- B. fateatum* (Lindl.) Rehb. f.
- B. falcipetalum* Lindl.
- B. flavidum* Lindl.
- B. graminifolium* Summerh.
- B. imbricatum* Lindl.
- B. intertextum* Lindl.
- B. Linderi* Summerh.
- B. lupatinum* Lindl.
- B. magnibracteatum* Summerh.
- B. maximum* (Lindl.) Rehb. f.
- B. melanorrhochis* (Rehb. f.) Rehb. f. ex De Wild.
- B. nigrifolium* Rendle
- B. oreostyles* Rehb. f.
- B. oxypterum* (Lindl.) Rehb. f.
- B. phaeopogon* Schltr.
- B. pipio* Rehb. f.
- B. recurvum* Lindl.
- B. rhizophorum* Lindl.
- B. saltatorium* Lindl.
- B. tentaculigerum* Rehb. f.
- B. velutinum* (Lindl.) Rehb. f.

CALYPTROCHILUM

- C. Christyanum* (Rehb. f.) Summerh.
- C. emarginatum* (Sw.) Schltr.

CHAMAELANGIS

- C. ichneumonea* (Lindl.) Schltr.
- C. vesicata* (Lindl.) Schltr.
- C. sp. nov.*

CHAULIODON

- C. Buntingii* Summerh.

CYRTOCHIS

- C. arcuata* (Lindl.) Schltr.
- C. Aschersonii* (Kraenzl.) Schltr.
- C. hamata* (Rolfe) Schltr.
- C. Monteiroi* (Rehb. f.) Schltr.
- C. ringens* (Rehb. f.) Summerh.

DIAPHANANTHE

- D. bidens* (Sw.) Schltr.
- D. curvata* (Rolfe) Summerh.
- D. laxiflora* (Summerh.) Summerh.
- D. pellucida* (Lindl.) Schltr.
- D. Quintastii* (Rolfe) Schltr.
- D. rutiba* (Rehb. f.) Summerh.
- D. suborbicularis* Summerh.
- D. sp. nov.*

DINKLAGEELLA

- D. minor* Summerh.

EGGELINGIA

- E. clavata* Summerh.

ENCEHEIRIDIUM

- E. macrorrhynchium* (Schltr.) Summerh.

EURYCHONE

- E. Rothschildiana* (O'Brien) Schltr

GENYORCHIS

- G. pumila* (Sw.) Schltr.

GRAPHOKAKIS

- G. tarida* (Sw.) O. Klze.

HABENARIA

- H. procera* (Sw.) Lindl.

LISTROSTACHYS

- L. perlusa* (Lindl.) Rehb. f.

MICROGOBLIA

- M. caespitosa* (Rolfe) Summerh.
- M. dahomeensis* (Finet) Summerh.

PLECTRHELMINTHUS

- P. caudatus* (Lindl.) Summerh.

PODANGIS

- P. dactyloceras* (Rehb. f.) Schltr.

POLYSTACHYA

- P. Adansoniae* Rehb. f.
- P. affinis* Lindl.
- P. dotteophytlla* Schltr.

- P. cf. fusiformis* (Thou.) Lindl.
P. galeata (Sw.) Rehb. f.
P. gotungensis Rehb. f.
P. inconspicua Rendle
P. laxiflora Lindl.
P. modesta Rehb. f.
P. mukandaensis De Wild.
P. odorata Lindl.
P. paniculata (Sw.) Rolfe
P. perva Summerh.
P. polychæte Kraenzl.
P. ramulosa Lindl.
P. reflexa Lindl.
P. subulata Finet
P. tenuissima Kraenzl.
P. tessellata Lindl.

RANGAERIS

- R. muscicota* (Rehb. f.) Summerh.
R. rhipsalisocia (Rehb. f.) Summerh.

SOLENANGIS

- S. clavata* (Rolfe) Schltr.
S. scandens (Schltr.) Schltr.

STOLZIA

- S. repens* (Rolfe) Summerh.

TÆNIOPHYLLUM

- T. Coxii* (Summerh.) Summerh.

TRIDACTYLE

- T. anthomaniaca* (Rehb. f.) Summerh.
T. armeniaca (Lindl.) Schltr.
T. bicaudata (Lindl.) Schltr.
T. brevicatcarata Summerh.
T. crassifolia Summerh.
T. Gentlii (De Wild.) Schltr.
T. tridentata (Harv.) Schltr.

VANILLA

- V. africana* Lindl.
V. crenulata Rolfe
V. imperialis Kraenzl.
V. ramosa Rolfe